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ABSTRACT

This study investigates pre-enrollment factors, particularly those related to computer confidence, in relation to persistence in the community college. Data on sex, ethnicity, reading level, high school grade point average (GPA), goal for attending college, and self-reported ability to use five computer application programs were gathered from 543 traditional, entering students at a community college in the University of Hawaii system. The data were analyzed in relation to the students' persistence at the beginning of the subsequent semester. Univariate and multivariate statistical analyses were employed to study attrition rates. Results of the logistic regression indicate that ethnicity, goal for attending college, confidence in using spreadsheets for college work, and the interaction between high school GPA and total number of computer skills in which the student is confident are related to persistence in college. While future studies are needed to determine direct causal effects, community college administrators may wish to consider designing pilot programs in computer skills training for the at-risk entering student. (Contains 26 references.) (Author/SWC)

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Title:

Computer Confidence: Factors Associated with Retention in the Community College

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Abstract

Pre-enrollment factors, particularly those related to computer confidence in using computer applications, were investigated in relation to persistence in the community college. Data on sex, ethnicity, reading level, high school grade point average (GPA), goal for attending college, and self-reported ability to use five computer application programs: word processing, database, spreadsheets, graphics, and on-line communications programs were gathered from 543 traditional, entering students and analyzed in relation to the students' persistence at the beginning of the subsequent semester. Univariate and multivariate statistical analyses were employed. Results of the logistic regression indicate that ethnicity, goal for attending college, confidence in using spreadsheets for college work, and the interaction between high school GPA and total number of computer skills that the student is confident using for college work are related to persistence in college. While future studies are needed to determine direct causal effects, community college administrators may wish to consider designing pilot programs in computer skills training for the at risk entering student.

Confidence in Types of Computer Use: Factors Associated with Retention in the Community College

Thirty-nine percent of the students pursuing higher education in the nation are enrolled in two year colleges (U. S. Department of Education, 1994). Although enrollment levels for the two year college population are projected to increase, a critical concern among administrators at these institutions is student retention. National survey data on the attrition of two-year college students from 1972 through 1990 show that, based on full-time, or a combination of full- and part-time, enrollment statistics, 40% to 44% of entering students do not persist to the second year (Tinto, 1993). Although some of these academic leavers may not consider themselves "dropouts" but rather "stopouts" who plan to return to college at some point in time (Bonham and Luckie, 1993; Conklin, 1993), their behaviors can be costly to their institutions, particularly as institutional resources become more limited. Colleges can plan resource allocations more effectively with consistent patterns of enrollment; students can also plan their futures more effectively when following a consistent attendance pattern.

At the same time, the nature of the K-12 experience for recent high school graduates has been changing as their potential for being exposed to newer technologies has increased. Data on 78% of 16,100 public school districts and intermediate units in the United States reflect a change from a ratio of 125 students per computer since the 1983-1984 school year to a ratio of 14 students per computer in 1993-1994, along with increased use of modems, local area networks and peripherals (Quality Education Data, 1994b). Projected spending for computer hardware in 1994 was estimated at $10,202,527,565 (Quality Education Data, 1994a).

The question arises of whether this increase in computing resources in the schools shows indications of contributing to success in college. More specifically, Q_1: Do traditional, entering community college students who indicate confidence in their ability to use one or more computer application program(s), or in their ability to use a specific type of computer application program (word processing, graphics, database, spreadsheets, on-line communications) to carry out college assignments demonstrate greater persistence in college after one semester than those who do not indicate such ability? Additionally, Q_2: Are the variables of gender, reading level, high school grade point average (GPA), ethnicity, and goals factors in this relationship?

Background

Student pre-enrollment factors, such as, gender, ethnicity, high school GPA, college aspirations; student college factors, such as, college GPA, academic and social integration into college, full- and part-time enrollment status; and institutional characteristics, such as, contact with faculty, access to resources, and availability of financial aid, have all been identified as playing a complex role in student retention (Gaither, 1992; Pascarella & Terenzini, 1991; Tinto, 1994). The complex role that confidence plays toward applying computer skills to academic work has also emerged in regard to factors, such as, age and motivation (Klein, Knupfer, & Crooks, 1993), gender, computer experience, and age (Loyd & Gressard, 1984), computer literacy levels (Hignite & Echternacht, 1992; Mahmood & Medewitz, 1989), and prior

knowledge of, use of, and access to computers (Malaney, & Thurman, 1989). Despite extensive studies on college retention and on computer literacy, little research has been designed to explore relationships between the two.

Broadly defined, computer literacy includes student self-efficacy toward computer use as well as knowledge about computers and ability in computer usage (Simonson, Maurer, Montag-Torardi & Whitaker, 1987). In their meta-analysis of twenty years of college retention research, Pascarella and Terenzini (1991) state that "...the impact of college is largely determined by the individual's quality of effort and level of involvement in both academic and nonacademic activities". Might one, therefore, ask if levels of computer literacy could be related to some degree to the "quality of effort" that a student expends in college?

While concerns have also arisen over providing students with up-to-date computers and equitable access to computers, more importantly, research is needed related to computer use and learning (Apple, 1991; Becker, 1991; Billings, 1986; Muffoletto & Knupfer, 1993). Given the direct high cost of obtaining and maintaining computers and the indirect cost of training teachers, as well as the impact of computers on curriculum (Billings, 1986), there is a continuing need for research that examines the relation of computers to various aspects of learning.

The purpose of this study was to investigate a broad learning outcome, persistence in college, in relation to entering community college students' attitudes toward computers . Focus was placed on the relationship of confidence in the computer use of commonly used computer application programs to persistence in college in an attempt to gather preliminary data on the pre-enrollment characteristic of computer confidence in relation to these specific computer applications.

Method

The study was designed as a preliminary investigation into the relationship between persistence in community college and computer ability.

The participants were traditional, first year entering students who participated in the regular Orientation, Test, Advising, and Registration sessions (OTAR) conducted throughout the summer of 1993 at one of the largest community colleges in the University of Hawaii System. Recent high school graduates were selected because of the likelihood that they would have had experience using computers and would have formed opinions about their ability to use computer applications for carrying out college assignments.

As part of the OTAR process, the students complete a questionnaire designed to gather personal background and attitudinal data. For this study survey items, constructed by the authors, were added to gather data on the confidence students had in using specific computer application programs to carry out college work. This specialized strand of the overall analysis of the assessment process, focused on determining if such computer usage, specifically, word processing, computer graphics, spreadsheets, databases, and ability to access information electronically on-line could be factors in subsequent retention in college. The students' responses concerning confidence using computer applications were also calculated to obtain a total score, hereafter referred to as computer score. That score had the potential of ranging from zero to five.

On the computer survey, students were presented with a forced choice option of "yes", "no", and "uncertain" as it was unrealistic to ask them to indicate the degree to which they were confident in using these application programs to carry out college assignments. Either they would use the application to carry out a college assignment or they would not. The uncertain category was included to discourage some students from skipping a question. This study was designed to collapse the uncertain responses into the "no" response section during the data analysis phase of the study. Pilot testing of the instrument carried out prior to the initiation of the regular test sessions, employing a test-retest approach and interviewing techniques resulted in obtaining a reliability coefficient of .98, indicating high reliability for the instrument.

Six hundred fifteen students responded to the computer survey and to the request for information on pre-enrollment characteristics of gender, ethnicity, goal for attending college, entry level academic ability reflected through high school GPA, and reading score on the Nelson Denny reading test.

At the start of the second semester these students were tracked to check for re-enrollment in the college. Using student identification numbers, students were separated into groups delineated as persisters and as non-persisters. From the initial 615 participants, a total of 543 students consisting of those who had persisted and those who had left the college, were identified as having complete data sets $n = 418$ and $n = 125$ respectively. No attempt was made in this study to distinguish between "dropouts" and "stopouts".

Data Analysis

Data obtained from the participants were coded and entered into a computer database for analysis using SPSS for UNIX. Univariate comparisons were employed to test for differences between the two sets of students, persisters and non-persisters, in relation to the selected pre-enrollments factors. The chi-square statistic was used to test for the significance of the relationship between persistence in college and these factors.

Cells where small numbers were reported were collapsed, resulting in the ethnic categories of "Blacks" and "Hispanics" being added to the "Other" ethnic category. For the same reason, during the multivariate analysis process, computer scores of three through five were collapsed into a new category entitled, "three or more".

Treating the computer score and high school GPA as continuous variables, the possible relationship of confidence in ability to use one or more computer applications in combination with high school GPA levels to persistence in college was tested through a one-way analysis of variance.

To investigate the complex relationship of the factors together in relation to the dichotomous criterion variables of persistence and non-persistence in college, logistic regression was employed using a forward stepwise approach that selects predictors in order of importance. The forward stepwise method was chosen because of its applicability to college retention research studies designed to measure the dichotomous dependent variables of persistence and non-persistence in retention (Dey & Astin, 1993) and because of its power in selecting variables to remain in the final model (Retherford & Choe, 1993). The significance of each variable was tested with the Wald statistic. The probability for entering a variable into the model was set for $p \leq .05$ and the probability for removing it set at < 0.1.

Results

The results of the chi-square analyses for the pre-entry level characteristics of gender, ethnicity, entry level academic ability, reading ability, and goal for attending college indicate that gender, high school GPA, and reading level as measured by the Nelson Denny reading test, are not significantly related to retention. Ethnicity and goal for attending college were shown to be significantly related to retention in college, c^2 (4, N = 543) = 14.58, $p < .01$ and c^2 (, N = 543) = 11.46 $p < .01$ respectively. Asians were identified as the ethnic group that persisted at a greater rate than anticipated. Filipinos persisted slightly above the anticipated rate. Persistence rates were less than anticipated for all other ethnic groups.

Those students whose goal was transferring to a four year college and those students who indicated their goal was different from the standard options for attending community college persisted at higher rates. Interpretations about the significance of the latter group should be made cautiously, however, because of the small number of respondents in this category who persisted ($n = 18$).

Being a confident user of computer applications or not, was not significantly related to persistence in college. Those who persisted were less likely to express confidence for using word processing, graphics, databases, and on-line communications. Those students who were confident about their ability to use spreadsheet applications were the only type of specific computer application users who showed some indication of being more likely to persist than anticipated.

An examination the results presented in the crosstabulation tables in relation to computer score, showed no clear pattern of use emerging in regard to the number of skills students indicated they were confident in applying. The

analysis of the interaction of the two variables: high school GPA and computer score indicated a significant effect, $p = .01$.

Table 1 lists the results of the forward stepwise logistic regression in which the important variables were examined together, presenting variables that remained in the equation along with their coefficient, standard error and indication of significance levels. The standards set for the equation were: for gender, being male; for ethnicity, being Asian; for high school GPA, having an average GPA; for reading, reading at or above the standard; for goal, planning to transfer to a four year college; and for each individual computer application, indicating being a confident user. For the computer score the standard was set at zero. The same standards were retained for the interaction variable of high school GPA and computer score.

The results shown in the display of the logistic regression model indicate that ethnicity, goal for attending college, confidence in using spreadsheet computer applications, and the interaction between high school GPA and confidence in total computer skills are significantly related to persistence in college.

Of particular note is that the majority of the significant variables indicate a negative effect on persistence. For example, the results suggest that those students who identify their ethnicity as being Hawaiian or Pacific Islander, White or Other, are significantly less likely to persist in college than the ethnic group used as the standard, the Asians. This negative effect is true for those students whose goal for college is personal enrichment and obtaining a two year degree. They are less likely to remain in college than their comparison group, those whose goal is to transfer to a four year school

The computer related variables that reflect significance are positively related to retention. Students who express confidence toward using spreadsheet applications for college work are significantly more apt to persist than those who do not indicate such confidence. In comparison to students with average high school GPA's who have indicated confidence in using no computer applications, students with low high school GPA's and three or more computer skills and those with high GPA's and two computer skills are significantly more likely to remain in college. As both these groups have small numbers of students, with the latter group containing less than fifteen students, the results of this interaction should be interpreted cautiously.

The factors of gender, high school GPA alone, reading level, and confidence in the separate skills of using word processing, databases, graphics, on-line communications and computer score alone did not contribute to the model.

The model created by the results of the logistic regression correctly classified 76.8% of the cases in terms of persistence in college; 26.8% more than would be accounted for by chance. Its limitations arise in its ability to predict persisters more accurately than it predicts non-persisters.

Discussion

The results of this study indicate that certain pre-entry student variables do relate to persistence in college with the categories of organismic factors, goal for attending college, and confidence in employing computer applications to college work each contributing to the resultant model. The investigation answered the research question, Q_1, with the finding that, for students in this study, being confident in applying a specific computer application, spreadsheets, is indicated as being the only computer application that appears related to persistence in college in conjunction with the other variables selected in the model. Being confident in using a total number of computer applications appears to only be related to persistence for students with either low or high GPA's. Closer scrutiny, however is warranted because of the small number of cases that contributed to the effect.

While at first it may appear surprising that having confidence in using spreadsheets was the one specific computer application that contributed to the equation, it may be a result of its possible relationship to mathematical ability, an aspect for which spreadsheet applications are predominantly used, and an aspect for which this study was not designed to investigate. Future studies may show that the spreadsheet factor is an effect of mathematical ability.

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Research question Q_2 was addressed with the finding that ethnicity, goal for attending college and high school GPA in interaction with computer score appears to influence persistence in college for the students in this study.

The confidence in spreadsheet use factor was selected for inclusion in the equation during the multivariate analysis of the data, although it was not a significant factor when considered by itself. The lack of contribution that the other specific computer applications made to the model is not surprising, given the complexity of determining the relationship between attitudes toward computers and computer literacy. Hignite and Echternacht (1992) have documented this condition in studies with college populations. Mixed results may be found regarding the relationship between students' ability to use computers and planned future use. Larson and Smith (1993) found that entering college students who were computer users were less likely to have positive attitudes toward using computers. For the students in Malaney's and Thurman's (1989) college-based study, however, computer use before entering college, when combined with access to computers and anticipated future computer use, showed indication of serving to identify college users.

Although both the Larson and Smith (1993) sample and the participants in this study both gave indication of being able to use word processing, spreadsheets and graphics applications, more than half of the former indicated capability with these three applications; for the students in this study such confidence in using applications were indicated only for word processing. The lower confidence levels evidenced by these students may reflect the more demanding wording of the items in the survey where respondents were asked to state their confidence in using the various computer applications at the level of "carrying out college assignments". Computer usage in the Larson and Smith survey simply inquired about "familiarity" with the applications.

The omission of the confidence in word processing factor from the final logistic regression equation appears to be related to findings by Oliver and Kerr (1993) and Power, Fowles, Farnum, and Ramsey (1992) whose studies of actual word processing use by college students indicate that its use does not contribute to improved grades and scores. In regard to college students' writing, Oliver and Kerr found that the level of revisions, rather than the use of word processing contributed to improved grades on college students' essays. Powers et al. found that handwritten versus word processed work resulted in higher scores for the handwritten submissions.

As this study sought only to investigate the effect of pre-enrollment factors, the small contribution that this resulting model for persistence in college makes in identifying non-persisters may be explained by the work of Gates & Creamer (1984), who found in their review of a sampling of community college student records from a national database, that pre-enrollment variables account for only 4.3% of the variation in retention when such variables are the only type of variables used in the analysis. This study was not designed to gather data on student college or institutional factors that might contribute to persistence in college. Future studies could be designed to investigate the effect that the addition of such data would have on the resulting model.

Summary and Conclusions

This study sought to answer questions concerning the percentage of entering community college students who are computer confident and whether this confidence has any immediate impact on retention. If the cutting edge campus of the future is to be on the information superhighway, how important is it for students to arrive at the campus computer confident? Although limited by being based on the results of participants from one community college whose student body has a higher proportion of Asian, Filipino, and Hawaiian or Pacific Islanders than other community colleges; it does provide preliminary data and a framework in which other researchers may attempt to answer these and similar questions as they begin to address the broad questions posed by Bork (1993) with regard to the need for determining effective uses for computers. While future studies are needed to determine direct causal effects, the results of this study raise questions about the type and time frame for providing technological support to entering community college students. Community college administrators may want to consider developing pilot computer skills training sessions to be offered prior to college entry for the traditional, entering high risk students to determine the possible contribution that such training may have on subsequent student persistence in college.

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Table 1
Logistic Regression on the Effect of Selected Pre-Enrollment Characteristics on Persistence in the Community

Independent Variables	S.E. Coefficient	Logit
Organismic Variables		
Ethnicity		
Hawaiian/Pacific Islander	.3592	-1.2071***
White	.3894	- .9655**
Filipino	.3631	- .3652
Other, Black, Hispanic, American Indian	.3675	-1.0334**
Academic Characteristics and Goals		
Goal for attending college		
Personal enrichment	.8008	-1.6382*
Vocational/Technical certificate	.5314	- .7373
Two year degree	.3136	- .8513**
Other	.6491	.3660
Confidence in Computer Skills		
Spreadsheet	.3110	.8767*
Interactions with Confidence in Computer Skills		
GPA by confidence in total computer skills		
Low GPA by one computer skill	.7123	.8060
Low GPA by two computer skills	.8260	- .4212
Low GPA by three or more computer skills	.8837	3.2919***
High GPA by one computer skill	.6882	.5669
High GPA by two computer skills	.8487	1.6734*
High GPA by three or more computer skills	.6538	.8493
Intercept	.2470	.6697**

Note. Reference categories for the categorical variables in order of appearance above are Asian, transfer to a four year college, average GPA, and confidence in spreadsheet skills. For the interaction terms the reference is average GPA and confidence in zero computer skills. Variables that were not selected during the forward stepwise variable selection are gender, high school GPA, reading level, confidence in: word processing, database, graphics, on-line communications skills, and confidence in total number of computer skills.
* $p < .05$; ** $p < .01$, *** $p < 001$

Author Note

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